

## On the Scaphium of Gosse.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

The name *Scaphium*, for a certain portion of the male genital armature of lepidoptera, was given by Gosse\* to a process whose exact position has not apparently been understood clearly by subsequent writers. At any rate, trying to understand Gosse, and to agree with the interpretations usually placed on his descriptions, I have to confess, that in common with various authorities, I have fallen into error, and confounded the *Scaphium* with the sternite (ventral plate) of the 10th abdominal segment.

Mr. Pierce is, I believe, the only authority of any note who has applied the name correctly.

I desire to confess my error in the matter, and, if possible, to make it manifest to those with whom I have been misled.

In the genus *Papilio* the scaphium is a highly-developed and complicated mass between the uncus (dorsal portion or tergite of 10th abdominal segment) and the ædæagus; in all other groups it is much more simple or wanting.

The point on which I went astray was in regarding the *scaphium* as being *subanal*. This was the result of depending on Gosse's critical remarks instead of on my own observations.

Gosse, in his latest remarks on *Ornithoptera remus*, which he makes in an appendix, but which agree with sundry other passages elsewhere in his papers, distinctly asserts that the anal opening is between the uncus and scaphium. He says: "In both *O. remus* and *O. haliphron*, I have demonstrated the presence of an orifice leading from the abdominal cavity between the uncus and the scaphium, and I have passed a fine needle through it—though from the extreme minuteness of the parts and their dry condition, the demonstration was not quite so satisfactory as I could wish. Still I can find no anal orifice possible anywhere else than here." (*Trans. Linn. Soc., Zool.*, 2nd series, vol. ii., p. 336.) Gosse does not seem to have really observed the anus at all.

My error, then, consisted in accepting Gosse's description without checking it for myself in *Papilio*, for the organ has no very prominent existence in the other groups which I have examined, and I felt no doubt that a well-developed process between the uncus and the ædæagus must be the scaphium.

The organ I have called the scaphium is really the sternite of the 10th abdominal segment. It is well-developed in the *Sphingidae* and various other families.

Mr. Pierce and Mr. Burrows both place the scaphium where it really is, *above* the anus, and have more than once remonstrated with me for placing it below (where Gosse says it is). I don't know whether they are familiar with groups in which the 10th sternite is marked.

I have now examined several *Papilionidae* with Mr. Burrows' admonitions on the one hand, and Gosse's text and figures on the other.

The position of the anus in *Papilio* appears to be at a point close

\* *Trans. Linnean Soc.*, 2nd series, vol. ii., Zoology, p. 275, 1883.

to the end of the scaphium, but beneath it. There is no definite 10th sternite. (See Plate x.)

I have not tried to make any exhaustive search, but the few continental authorities I have looked into seem to have taken the same view that I did, that the *scaphium* was a sub-anal process, as, for instance, Spuler's *Hofmann*, not itself an authority, but to a great extent a summary of authorities. One of the exceptions is apparently really more in error than the others, *viz.*, Hermann Stitz, "Genitalapparat der Mikrolepidopteren," in the *Zoologische Jahrbuch* 1900, who makes the supra-anal "*stuck*" the scaphium, but unfortunately calls the sub-anal "*stuck*" the uncus. In fact he still places the uncus and scaphium one above and one below the anus, but reverses the names. Pierce very accurately describes the position of the *scaphium* (*Genitalia of the Noctuidae*, p. 13): "Attached to the anus on the upper surface is a process present in some only of the *Noctuidae*, which is *The Scaphium* (of Gosse)."

This is a marked instance of description being better than a figure; the description is accurate and complete; the figure shows the scaphium as entirely apart from the anal tube, and in fact similarly situated to an unnamed process present in some *Notodontidae*. (See Plate xi.)

The anal opening is usually on the level of the floor of the cavity; the usual exception is when a scaphium is present; in that case there is a projecting anal tube, as Pierce shows. The projection is maintained by the scaphium being a solid chitinous rod or plate along its dorsal surface. In *Acronycta tridens*, for example, it is a simple, slight, straight rod. In *Papilio* its upper surface is variously developed in complicated fashion, and there often appears to be a development beyond the point to which it is attached to the anal tube, the anal opening being then some way from the extremity. I have not, however, examined species enough to have satisfied myself of anything beyond the general fact, that the scaphium in *Papilio* is more or less attached to the upper surface of the anal tube.

There is another case in which the anus is at the extremity of a projecting anal tube. Here the supporting chitinous piece is not on the dorsal surface of the tube as the scaphium is, but beneath it, and would be entitled to Pierce's name of *subscaphium*. This structure occurs in *Hydrocampa nymphaeata*, *Ptilodontis palpina*, etc. I believe all other cases of a projecting anal tube, *i.e.*, without chitinous support, are temporary if in the living animal, the result of pressure if in preparations.

It is perhaps merely the result of the few specimens I have examined, perhaps of a defect of memory, but I do not remember to have seen a well-developed scaphium in any species in which the 10th abdominal sternite was well in evidence. These two structures being therefore certainly rarely, possibly never, associated, no doubt accounts for the name scaphium having been so generally applied to the 10th sternite.

The scaphium is indeed not a very common structure, it occurs in some *Noctuae*, as for example *Acronycta tridens*, where it is a very simple, delicate, straight rod along the dorsal aspect of the anal tube, in *Mamestra persicariae* it is notably developed; the 10th sternite, if ever present in *Noctuae*, is very rare, though the scaphium is not often very distinct.

In looking to find some other group besides *Papilio* with a pronounced scaphium, one turns at first naturally to the *Hesperidae*. Here in *Syrichthys* one finds at once a process very like the Papilionid scaphium, a process below the uncus and with very varied armament. On examination, however, one finds that it is below, and quite separate from, the anus, and is neither scaphium or subscaphium, but the ventral plate (sternite) of the 10th abdominal segment.

In the *Nymphalidae* the two plates of the 10th segment are often well developed, but neither scaphium nor subscaphium is present.

In the *Sphingidae* the condition is much the same, but usually in the *Nymphalidae* the two plates are small, simple, and articulated together, and when open they just give room for the anus. In the *Sphingidae* they are more frequently long and curved, looking, on lateral view, something like the opened beak of a raptorial bird. In a few cases the uncus is bifurcate and even the sternite also, and the anus centrally between them.

In some *Notodontidae* we find four similar pieces, each one, however, rather more independent of the others than in the *Sphingidae*. Here one says, at first, is something to support those who see a close relationship between the *Sphingidae* and the *Notodontidae*. It is, however, not so. All four processes belong to the 10th tergite, the anus being well below them. Then, of course, one would suppose the two lower are scaphium. No, there is an anal tube projecting, but it is perfectly free from these dorsal processes, and is supported by a slight subscaphium. (Noted from *Ptilodontis palpina*, others seem to be fairly identical.) This piece may be called the "subuncus" (Plate xi).

The name "scaphium," as used erroneously, is sometimes perhaps applied to the "subscaphium," but more usually to the 10th abdominal sternite, and this piece, if one objects to "tenth abdominal sternite" as being a description and not a name, is in want of a short name. If so, I would call it the "gnathus" (*γναθος*), anglicised "gnath," in allusion to its so often resembling a lower jaw, as in the *Nymphalidae*, *Pyralidae*, etc., where, with the uncus, the resemblance to a beak is often very strong.

P.S.—Since writing this note I have seen Dr. McDunnough's paper in the *Canadian Entomologist* for June, 1911, and observe that he has, like so many others, fallen into the same error as myself, and which I have here corrected, *viz.*, regarding the "scaphium" of Gosse as sub-anal, whereas it is really supra-anal. It may be noted that the "tegumen" of Buchanan-White is the whole circle of the 9th abdominal segment, though he refers to the lower portion as a ring [*Trans. Linn. Soc.*, 2nd Ser., vol. i., p. 358, 1878(76)]. The restriction of the term "tegumen" to the dorsal portion, and giving the name "ring" to the remainder, is thus possibly correct.

## EXPLANATION OF PLATE X.

Fig. A.—Portion of appendages of *Papilio erithonius* (side view).

Fig. B.—Portion of appendages of *P. mecrope* (side view).

Fig. C.—Portion of appendages of *P. nireus* (side view).

In each case the numbers refer to :—

- 1.—Uncus.
- 2.—Scaphium.
- 3.—Anus.

4.—Portion of *Ædæagus*. (I use the word *Ædæagus* in the sense of *Ædæagus* + *Vesica* = *Penis*.)

Though they come out well in the photographs, the anal tubes are so transparent that the process reproductions are less satisfactory than is desirable, especially in Fig. A.

#### EXPLANATION OF PLATE XI.

Diagrams of several developments of the 10th abdominal segment (side view):—

A.—As in *PAPILIO* (*machaon*). 3. Scaphium of Gosse attached to upper surface of anal tube.

B.—As in *ACRONYCTA* (*tridens*). 3. Scaphium quite homologous with Gosse's scaphium in *Papilio*.

C.—As in *NYMPHALIDS*, *SPHINGES*, *PYRALES*, etc. Dorsal and ventral plates only.

D.—As in *NOTODONTIDS* (*P. palpina*). 2. Appendages to uncus. 4. Subscaphium.

E.—As in *HYDROCAMPA* and some other *Pyrales*. 4. Subscaphium.

F.—As in *SCOPARIA* and some other *Pyrales*, essentially the same as Fig. C.

G.—Showing all processes as if present. Actually only two or at most three are present together—(1) uncus, (2) process of uncus, subuncus, (3) scaphium, (4) anus, (5) subscaphium, (6) 10th sternite (ventral plate of 10th abdominal segment) gnath (*gnathus*).

H.—From Pierce's figure. 3. Scaphium shown right away from anal tube (a). In the *NOCTUÆ* it is usually placed as in Fig. B.  
(The numbers in each case as in Fig. G.)

### A Month in Switzerland and elsewhere.

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(Continued from page 267).

(ii.) FAIDO, REAZZINO, AND MENDRISIO.—A pouring wet night and a hopelessly dull day greatly lessened my regret in leaving Samoussy; the day-service of trains not being so good as the night-service, the whole of the 17th was expended in getting to Bâle. I had intended going up to Hinterzarten, in the Black Forest, but we arrived in pouring rain, which continued all night and the next day, so we pressed on in the afternoon to Faido, on the south of the St. Gothard Pass. The next day was no better, so I went down to Bellinzona and on to Cadenazzo in hopes of finding better weather there—as we had taken “abonnement général” tickets for a month at Bâle, distance was no object—but the only difference was that the rain was warmer and more of a drizzle, so there was nothing to be done but come straight back. The following day there were gleams of sun in the morning, and I crossed the river in hopes of finding *Brenthis thore*, but quite without success. *Pararge maera* was fresh and fine in both sexes, and *Coenonympha arcania* of a size generally verging towards *insubrica*, but in markings more approaching *darwiniana*, was not scarce. I found also a few nice *Brenthis selene*, quite freshly emerged, and equally fresh *Aporia crataegi*, *Pararge egeria*, and *Cyaniris semiargus*. *Venilia maculata* was in great abundance, mostly of the deepest orange in colour though a few pale specimens occurred among them; *Gnophria rubricollis* was also in evidence, and one very fresh ♂ of *Euchelia dominula*. The afternoon, though dry, was absolutely sunless, and neither at Airolo, nor walking down the splendid gorge between Rodi and Faido, did I see anything but a few *P. maera*.

The next day, the 21st, being fine, I went down to my old hunting-ground at Reazzino, hoping to find ♀s of the first brood of *Melitæa*